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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SHARON, AYAL I

ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/404,122	YAHIL ET AL.	
	Examiner	Art Unit	
	Ayal I Sharon	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 1999* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☒ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *11* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Introduction

1. Claims 2-13 of U.S. Application 09/404,122 filed on 09/23/1999, and amended on 11/18/02, as well as claims 14-15 that were added on 11/18/02, are presented for examination. Applicant has cancelled Claim 1.

Oath/Declaration

2. On the home page of Rick Puetter (Last updated Feb. 21, 2000. See p.3), it is written that "The Pixon method is a high performance image reconstruction method developed by R. Pina and R. Puetter at USCD in 1992/1993 and accelerated in computational speed by Yahil and Puetter in 1996/1997". Clarification as to Mr. Pina's relationship to the claimed invention is requested.

Government License Rights to Contractor-Owned Inventions Made Under Federally Sponsored Research and Development

3. Where a Government contractor retains U.S. domestic patent rights, the contractor is required to include the following statement at the beginning of the application and any patents issued thereon:

> "The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of (contract No. or Grant No.) awarded by (Agency)."

If reference is made in the first sentence of the application to prior co-pending applications of the applicant, such prior applications must be referred to in the first sentence of the specification (37 CFR 1.78(a) and MPEP § 201.11), and in this case the required "Government License Rights" statement should follow immediately as the second paragraph of the specification. If there is no reference to an earlier application, the required "Government License Rights" statement should appear as the first paragraph of the specification. See 37 CFR § 1.77.

4. Examiner acknowledges the incorporated by reference to the instant application of U.S. Patents No. 5,912,993 and 6,353,688, both of which are assigned to the Regents of the University of California, and both of which have the above specified paragraph regarding U.S. Government patent rights.
5. During the process of examination, Examiner has been made aware of the existence of the following related prior art, authored by one of the applicants: "Information, Language, and Pixon-Based Image Reconstruction" by R.C. Puetter. One version of which (1995) is published in Non-Linear Signal and Image Analysis, Proceedings of the 11th Florida Workshop on Non-Linear Astronomy and Physics, University of Florida. A later version (1996) is published in Proceedings of SPIE.
6. Moreover, there is the article "Pixon-Based Multiresolution Image Reconstruction and the Quantification of Picture Information Content", Int'l. Journal of Image

Systems & Technologies pp.314-331, Winter 1995. And there is also an article "The Pixon Method of Image Reconstuction", Proc. ADASS '98 which specifically refers to the Winter 1995 Int'l. Journal of Image Systems & Technologies article.

7. The above mentioned articles specifically state that the work was supported in part by NASA grants NAG-53944, AR-07551.01-96A, as well as "grants from the NSF, the California Association for Research in Astronomy, and Cal Space". The aforementioned patents, which have been incorporated by reference, state that the U.S. government has rights to those patents pursuant to NSF grants AST-8819116 and AST-8922006, NASA grant NAG-51228, and U.S. Dept. of Energy grant DE-FG02-87ER40317. No mention of these or any other grants is made in the instant application. Clarification is requested.

Drawings

8. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed. Examiner objects to Fig. 1a and Fig.1b in accordance with 37 CFR 1.84(i). Lines are not uniformly thick and well defined.

Claim Interpretations

9. Examiner interprets "daily returns of financial securities" as being the prices of stocks, bonds, and other financial instruments at the end of trading on days in which the financial markets are open for business.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11. Claims 2-7 and 8-13 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 2, limitation "c" refers to "measured data points", and Claim 8 refers to "measured data". However, no means for "measuring" data points or obtaining "measured data points" is enabled in the specification. There also is no enablement of how the invention will differentiate between "measured" and non-"measured" data points. All dependent claims 3-7 and 9-13 inherit this defect.

Double Patenting

12. Claim 2 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,353,688. Although the conflicting claims are not identical, they are not patentably distinct from each other because the differences between the claims can be attributed to intended use.

13. Claim 8 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 8 of U.S. Patent No. 6,353,688. Although the conflicting claims are not identical, they are not patentably distinct from each other because the differences between the claims can be attributed to intended use.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. The prior art used for these rejections is as follows:

16. The MathWorks, Inc. "GARCH Toolbox: For Use With MATLAB", July 1999. (Henceforth referred to as "**Garch**")

17. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

18. Claims 2-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garch in view of Official Notice.

19. In regards to Claim 2, Garch teaches the following limitations of claim 2:

> 2. A computer-based method for prediction of behavior in a financial system using financial return data, the method comprising the steps of:
>
> (Garch: especially pp. vi-ix, and p.1-2 to p.1-5. Also, example on p.1-15)

(a) inputting the financial return data and a set of independent variables corresponding to properties of the financial system into a computer, wherein the financial return data comprises a plurality of data points collected over time;

(Garch: especially pp. vi-ix, and p.1-2 to p.1-5. Also, example on pp.1-16 to 1-17)

(b) defining a first subset of independent variables within the set of independent variables comprising a least quantity of independent variables estimated to fit the financial return data;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-71)

(c) determining a goodness-of-fit to the data at according to a selected goodness-of-fit criterion for each independent variable of the first subset of independent variables;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

(d) culling each independent variable within the first subset whose presence or elimination fails to change the goodness-of-fit;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

(e) defining a next subset of independent variables larger than the first subset of independent variables;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on pp.1-71 to 1-72)

(f) adding the next subset of independent variables to a remaining group of the first subset of independent variables to define a combined group of independent variables;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-71 to 1-72)

(g) determining the goodness-of-fit to the financial return data for the combined group of independent variables;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

(h) culling each independent variable of the combined group of independent variables whose presence or elimination fails to change the goodness-of-fit;

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

Garch does not expressly teach the following limitations:

(i) repeating steps (e) through (h) until the goodness-of-fit to the financial return data meets the selected goodness-of-fit criterion in a final iteration; and

(j) providing an output comprising the combined group of independent variables remaining after the final iteration, wherein the remaining independent variables comprise the smallest subset of independent variables that fits the financial return data.

However, Garch teaches that the Akaike and Bayesian Information Criteria (p.1-73 to p.1-74) are used to determine the complexity of different models. Garch also teaches that small and simpler is better (p.1-82)

Moreover, Garch teaches (p.1-70 to 1-73) evaluating the accuracy of models within a selected goodness-of-fit criteria (p.1-73). Garch also teaches assessing the significance of specified parameters (p.1-75 to 1-80) in order to eliminate irrelevant parameters from the model.

Official Notice is given that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Garch to iteratively eliminate irrelevant parameters while maintaining a desired goodness-of-fit, because as Garch expressly teaches:: "Specify the smallest, most simplistic models that adequately describe your data. This is especially relevant for estimation. Simple models are easier to estimate, easier to forecast, and easier to analyze. (Garch, p.1-82)."

20. In regards to claim 3, claim 2 is rejected as described above. Garch teaches the following limitations of claim 3:

3. The computer-based method of claim 2, wherein the plurality of financial return data points comprises daily returns of financial securities, wherein the daily returns have unknown covariances.

(Garch: especially p.1-2, p.2-24)

21. In regards to claim 4, claims 2-3 are rejected as described above. Garch teaches the following limitations of claim 4:

4. The computer-based method of claim 3, wherein the daily returns comprise a linear combination of unknown factors and a part that fluctuates independently corresponding to noise, according to the relationship

$$X_\alpha = \sum_{\beta=1}^{k} \Lambda_{\alpha,\beta} f_\beta + N_\alpha$$

where α and β are financial securities, $X\alpha$ is the daily return for financial security α, f_β is an unknown factor, $\Lambda_{\alpha,\beta}$ is a loading matrix, and N_α is the noise.

(Garch: especially p.1-6 to p.1-7; p.1-69; p.2-28 to 2-29; p.2-40 to p.2-45; p.2-52 to 2-54;)

22. In regards to claim 5, claim 2 is rejected as described above. Garch teaches the following limitations of claim 5:

5. The computer-based method of claim 2, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship

$$L = -2 \ln Pr(D|M) = \sum_{n} w_n (\ln ||V_n|| + x_n \circ V_n^{-1} \circ x_n)$$

where L is the log-likelihood function, V is the covariance matrix, Pr(D I M) is a goodness-of-fit quantity measuring the probability of data D given model M, and Wn is an arbitrary weight.

(Garch: especially p.2-4 to p.2-5; p.2-22 to p.2-25; p.2-28 to p.2-29)

23. In regards to claim 6, claim 2 is rejected as described above. Garch teaches the following limitations of claim 6:

> 6. The computer-based method of claim 2, wherein the least quantity of independent variables corresponds to zero unknown factors and a covariance matrix consisting of a diagonal.

Garch does not expressly teach either a least quantity of independent variables corresponds to zero unknown factors, nor a covariance matrix consisting of a diagonal.

Offiicial Notice is given that it is well known that a system with "zero unknown factors" is one in which all factors are known, and it is well known to be impossible for a system to have less than zero unknown factors.

Moreover, Official notice is given that it is well known in the field of statistics that a diagonal covariance matrix represents a system of independent variables.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Garch and Official Notice, because a modeled system in which all variables are known, and all variables are independent, is an extreme case which is easily solved and verified.

24. In regards to claim 7, claim 2 is rejected as described above. Garch teaches the following limitations of claim 7:

> 7. The computer-based method of claim 2, wherein the output comprises a covariance matrix containing a plurality of loading matrix coefficients, wherein the number of off-diagonal, non-zero loading matrix coefficients is minimized.

Garch does not expressly teach either a least quantity of independent variables corresponds to zero unknown factors, nor a covariance matrix consisting of a diagonal.

Offiicial Notice is given that it is well known that a system with "zero unknown factors" is one in which all factors are known, and it is well known to be impossible for a system to have less than zero unknown factors.

Moreover, Official notice is given that it is well known in the field of statistics that a diagonal covariance matrix represents a system of independent variables.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the the teachings of Garch and Official Notice, because a modeled system with zero unknown factors and independent variables is an extreme case which is easily solved, and is a simple way to test the solving method.

25. In regards to claim 8, Garch teaches the following limitations:

8. A system for prediction of behavior in a financial system using financial return data, the system comprising:

a computer having an input for receiving the return data comprising a plurality of data points collected over a period of time and a set of independent variables corresponding to properties of the financial system;

(Garch: especially pp. vi-ix, and p.1-2 to p.1-5. Also, example on pp.1-16 to 1-17)

...

...each iteration comprising identifying a subset of independent variables within the set of independent variables
(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-71))

and determining a goodness-of-fit to the measured data
(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

according to a selected goodness-of-fit criterion for each independent variable of the subset

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

eliminating each independent variable within the subset whose presence or elimination fails to change the goodness-of-fit at a predetermined level,

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

Garch does not expressly teach the following limitations:

> Computer software contained within the computer for performing a plurality of iterations
>
> ... combining after the plurality of iterations, the remaining independent variables to identify the smallest subset of independent variables that fits the financial return data to generate an output;

However, Garch teaches that the Akaike and Bayesian Information Criteria (p.1-73 to p.1-74) are used to determine the complexity of different models. Garch also teaches that small and simpler is better (p.1-82)

Moreover, Garch teaches (p.1-70 to 1-73) evaluating the accuracy of models within a selected goodness-of-fit criteria (p.1-73). Garch also teaches assessing the significance of specified parameters (p.1-75 to 1-80) in order to eliminate irrelevant parameters from the model.

Official Notice is given that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Garch to iteratively attempt to eliminate seemingly irrelevant parameters, and after each elimination to test to see if a desired goodness-of-fit was maintained, because as Garch expressly teaches: "Specify the smallest, most simplistic models that adequately describe your data. This is especially relevant for estimation. Simple models are easier to estimate, easier to forecast, and easier to analyze. (Garch, p.1-82)."

26. In regards to claim 9, claim 8 is rejected as described above. Garch teaches the following limitations of claim 9:

> 9. The system of claim 8, wherein the financial return data comprises daily returns of financial securities, wherein the daily returns have unknown covariances.
>
> (Garch: especially p.1-2, p.2-24)

27. In regards to claim 10, claims 8 and 9 are rejected as described above. Garch teaches the following limitations of claim 10:

> 10. The system of claim 9, wherein the daily returns comprise a linear combination of unknown factors and a part that fluctuates independently corresponding to noise, according to the relationship
>
> $$X_\alpha = \sum_{\beta=1}^{k} \Lambda_{\alpha,\beta} f_\beta + N_\alpha$$
>
> where α and β are financial securities, $X\alpha$ is the daily return for financial security α, f_β is an unknown factor, $\Lambda_{\alpha,\beta}$ is a loading matrix, and N_α is the noise.
>
> (Garch: especially p.1-6 to p.1-7; p.1-69; p.2-28 to 2-29; p.2-40 to p.2-45; p.2-52 to 2-54;)

28. In regards to claim 11, claim 8 is rejected as described above. Garch teaches the following limitations of claim 11:

> 11. The system of claim 8, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship
>
> $$L = -2 \ln Pr(D|M) = \sum_{n} w_n (\ln ||V_n|| + x_n \circ V_n^{-1} \circ x_n)$$
>
> where L is the log-likelihood function, V is the covariance matrix, Pr(D I M) is a goodness-of-fit quantity measuring the probability of data D given model M, and Wn is an arbitrary weight.
>
> (Garch: especially p.2-4 to p.2-5; p.2-22 to p.2-25; p.2-28 to p.2-29)

29. In regards to claim 12, claim 8 is rejected as described above. Garch teaches the following limitations of claim 12:

> 12. The system of claim 8, wherein the least quantity of independent variables corresponds to zero unknown factors and a covariance matrix consisting of a diagonal.
>
> Garch does not expressly teach either a least quantity of independent variables corresponds to zero unknown factors, nor a covariance matrix consisting of a diagonal.

Offiicial Notice is given that it is well known that a system with "zero unknown factors" is one in which all factors are known, and it is well known to be impossible for a system to have less than zero unknown factors.

Moreover, Official notice is given that it is well known in the field of statistics that a diagonal covariance matrix represents a system of independent variables.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Garch and Official Notice, because a modeled system in which all variables are known, and all variables are independent, is an extreme case which is easily solved and verified.

30. In regards to claim 13, claim 8 is rejected as described above. Garch teaches the following limitations of claim 13:

> 13. The system of claim 8, wherein the output comprises a covariance matrix containing a plurality of loading matrix coefficients, wherein the number of off-diagonal, non-zero loading matrix coefficients is minimized.

Garch does not expressly teach either a least quantity of independent variables corresponds to zero unknown factors, nor a covariance matrix consisting of a diagonal.

Offiicial Notice is given that it is well known that a system with "zero unknown factors" is one in which all factors are known, and it is well known to be impossible for a system to have less than zero unknown factors.

Moreover, Official notice is given that it is well known in the field of statistics that a diagonal covariance matrix represents a system of independent variables.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the the teachings of Garch and Official Notice, because a modeled system with zero unknown factors and independent variables is an extreme case which is easily solved, and is a simple way to test the solving method.

31. In regards to Claim 14, Garch teaches the following limitations of claim 14:

14. A computer-based method for prediction of behavior in a financial system comprising:
(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. Also, example on pp.1-16 to 1-17)

Estimating a covariance matrix of the financial system comprising a plurality of variables and a plurality of factors using a subset of the plurality of factors,
(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.2-24; p.A-2. In particular, example on p.2-5 and 2-24)

Wherein the subset comprises the minimum number of factors capable of describing the plurality of variables,
(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

Wherein the subset is selected by iteratively modeling each variable as a linear combination of unknown factors and a noise factor starting with zero factors and adding one factor with each new iteration until a model is identified for which no further improvement occurs.

(Garch: especially p.1-70 to p.1-84; p.2-4 to p.2-5; p.A-2. In particular, example on p.1-73)

32. In regards to claim 15, claim 14 is rejected as described above. Garch teaches the following limitations of claim 5:

15. The computer-based method of claim 14, wherein improvement is determined by a goodness-of-fit criterion comprising a log-likelihood function which is minimized using a conjugate gradient.

This claim is broader than claim 5, which is hereby repeated in full:

5. The computer-based method of claim 2, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship

$$L = -2 \ln Pr(D|M) = \sum_n w_n (\ln ||V_n|| + x_n \circ V_n^{-1} \circ x_n)$$

where L is the log-likelihood function, V is the covariance matrix, Pr(D I M) is a goodness-of-fit quantity measuring the probability of data D given model M, and Wn is an arbitrary weight.

(Garch: especially p.2-4 to p.2-5; p.2-22 to p.2-25; p.2-28 to p.2-29)

Response to Arguments

33. Examiner acknowledges Applicants' amendment to claims 2-13, and their addition of claims 14-15.

Information Disclosure Statement

34. Examiner acknowledges Applicants' supplemental IDS regarding the Pixon® method. Applicants argue that

> "Notwithstanding this submission, it is Applicants' position that the Pixon® method is distinct from the invention claimed in the present application. (paper #12, p.14)"

However, Examiner has only been provided with arguments that the two differ in terms of intended use. On the other hand, claimed subject matter such as the formula in claim 5 (also eq.3, p.9 of the specification) was found in 2 different prior art publications authored by the Applicants:

1. Puetter, R.C. "Pixon-Based Multiresolution Image Reconstruction and the Quantification of Picture Information Content", Int'l. Journal of Image Systems & Technologies pp.314-331, Winter 1995. (Referred to in the rejection of claim 5 in paper #10 as "**Puetter Publication 2**")

2. Puetter, R.C. "The Pixon(r) Method of Image Reconstuction", Proc. ADASS '98 (Nov. 1-4, 1998). In Astronomical Data Analysis Software and Systems VIII, Vol. 172, pp.307-316. (Referred to in the rejection of claim 5 in paper #10 as "**Puetter Publication 17**")

As a consequence of these discrepancies, Examiner is issuing a 37 C.F.R. § 1.105 Requirement for Information, which will be mailed with the Office Action.

Oath/Declaration

35. Examiner acknowledges Applicants' clarification regarding Dr. Pena's relationship to the claimed invention. However, Examiner respectfully disagrees

with Applicants' argument that the inventions are distinct because they are applied to different arts (image reconstruction, and financial data analysis).

Applicants are reminded that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

This objection is being maintained until a response to the 37 C.F.R. § 1.105 Requirement for Information shows that the instant application and the cited prior art differ in terms of functionality and not only in terms of intended use.

Government License Rights

36. Examiner acknowledges Applicants' clarification regarding the relationship of U.S. government grants to the claimed invention. However, Examiner respectfully disagrees with Applicants' argument that the inventions are distinct because they are applied to different arts (image reconstruction, and financial data analysis).

Applicants are reminded that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed

invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

This objection is being maintained until a response to the 37 C.F.R. § 1.105 Requirement for Information shows that the instant application and the cited prior art differ in terms of functionality and not only in terms of intended use.

Specification

37. Examiner acknowledges Applicants' amendment of the title. The objection to the title has been withdrawn.

38. Examiner acknowledges Applicants' amendment to the abstract. The objection to the abstract has been withdrawn.

Claim Rejections - 35 USC § 112

39. Examiner acknowledges Applicants' amendment of claims 2, 5-8 and 11-13 to include the terms "financial system" and "financial return data". Examiner considers this to be sufficient for providing a specific utility. Examiner has withdrawn the 35 USC § 101, and 35 USC § 112 1st Paragraph rejections relating to utility.

40. Examiner acknowledges Applicants' amendment of claims 2-13 to remove the term "measured" from "measured data points". Examiner considers this to be removing subject matter not described in the specification. Examiner has withdrawn the relevant 35 USC § 112 1st Paragraph rejections, except for Claim 2, limitation "c", which still contains the term "measured".

41. Examiner acknowledges Applicants' amendment of claims 2-13 to replace the term "predetermined minimum level", which is not support in the specification, with "goodness-of-fit", which is supported in the specification. Examiner has withdrawn the relevant 35 USC § 112 2nd Paragraph rejections.

Claim Rejections - 35 USC § 101

42. Examiner acknowledges Applicants' amendment of claims 2, 5-8 and 11-13 to include the terms "financial system" and "financial return data". Examiner considers this to be sufficient for providing a specific utility. Examiner has withdrawn all rejections relating to utility.

Claim Rejections - 35 USC § 103

43. The Applicants argue (paper #12, p.14) that "it is Applicants' position that the Pixon® method is distinct from the claimed invention in the present application". Applicants specifically argue (paper #12, pp.15-16):

"Each of Puetter articles identified by the Examiner, as well all of the Puetter articles citied in the accompanying Information Disclosure Statement are specifically drawn to image reconstruction." (p.15)

"The data analyzed using the present invention is clearly distinct from the type of data that can be analyzed using the Pixon® method. Financial data has no geometric structure, so it cannot be characterized in terms of geometric properties, such as size, area or shape. As a result, it would be impossible to create a "map" in the present invention."

Examiner wishes to point out to the Applicants that financial data, when plotted in graphs and charts, does have "geometric structure". Moreover, Examiner refers the Applicants to the article referred to in the rejections as "Puetter Publication 2" ("Pixon-Based Multiresolution Image Reconstruction and the Quantification of Picture Information Content", 1995). It teaches:

"Besides trying to persuade the reader that pixon-based methods represent the best image reconstruction method currently available, we hope to demonstrate that pixon-based methods have consequences and implications for fields outside of image restoration/reconstruction, including data compression and information theory. (p.1, col.2, para.2)"

Thus, by the admission of one of the Applicants, it is possible to use pixon-based methods on data "... for fields outside of image restoration/reconstruction".

44. Examiner wishes to remind the Applicants that Applicants' arguments cited immediately above in paragraph 40 constitute mere attorney argument. Support for these arguments will need to be provided in the form of references to prior art, references to the specification, or affidavits, or facsimile thereof.

45. Applicants' argument that the instant application is a distinct invention compared to the cited prior art because the cited art is for image reconstruction while the claimed invention is for financial data analysis. Examiner disagrees. The difference between the two is only in intended use. Applicant is reminded that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably

distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

46. The Applicants argue (paper #12, pp.16-17) that there would be no motivation to combine the Pixon® method for image processing with a financial analysis technique such as MatLab® for Finance. Applicants specifically argue:

"... As such, there would be no motivation to combine the Pixon® method with a technique such as MatLab® for Finance. The mere fact that financial prediction software such as MatLab® for Finance exists is insufficient to either motivate or teach one of ordinary skill in the art to significantly modify a geometrically-based method such as the Pixon® method to provide for prediction of behavior in an abstract, non-geometric system.(p.17)"

Examiner wishes to point out to the Applicants that financial data, when plotted in graphs and charts, does have "geometric structure". Moreover, Examiner refers the Applicants to the article referred to in the rejections as "Puetter Publication 2" ("Pixon-Based Multiresolution Image Reconstruction and the Quantification of Picture Information Content", 1995). It teaches in its Abstract (emphasis added):

"This paper reviews pixon-based image reconstruction, which in it[s] current formulation uses a multi-resolution language to quantify an image's Algorithmic Information Content (AIC) using **Bayesian techniques**. Each pixon (**or its generalization, the *information***) represents a fundamental quanta of an image's AIC ...

... Finally, we show how **the pixon provides a generalization of the Akaike information criterion**, how it relates to concepts of "coarse graining' and the the role of the Heisenberg Uncertainty Principle in statistical mechanics, provides a mechanism for optimal data compression, and represents a more optimal basis for image compression or reconstruction than wavelets. (p.1, col.1, para.1)"

The explicit references in the Abstract to "pixons" being "generalizations" of both (1) Bayesian techniques of Algorithmic Information Content, and (2) Akaike Information Criterion is very important. This is because contrary to Applicants' argument, financial prediction software such as MatLab® for Finance did not "merely exist" at the time of the claimed invention. In fact, MatLab® for Finance (as shown in the "Garch" reference) included techniques that the Applicants are claiming, such as the Akaike Information Criterion.

The "Garch" reference cited in the rejections teaches that the use of both (1) Bayesian techniques of Algorithmic Information Content, and (2) Akaike Information Criterion in financial applications was clearly old and well known in the art.

47. In light of the amendments to the claims that have defined the utility of the claims as being in the field of financial data analysis, new 35 USC § 103 rejections, based on new art (the Garch reference), have been applied.

The Garch reference clearly shows that AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) were available for use in Matlab's Garch toolbox component back in July 1999.

These criteria are equivalent to those taught in the Abstract of "Puetter Publication 2": (1) Bayesian techniques of Algorithmic Information Content, and (2) Akaike information criterion. This evidence clearly contradicts Applicants' argument that it would "not have been obvious" to use the formulas in the pixon® method for an "abstract, non-geometric system", i.e. financial data.

Conclusion

48. Applicant's arguments filed 11/18/02 have been fully considered but they are not persuasive.

49. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (703) 306-0297. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on (703) 305-9704. Any response to this office action should be mailed to:

Director of Patents and Trademarks
Washington, DC 20231

Hand-delivered responses should be brought to the following office:

4th floor receptionist's office
Crystal Park 2
2121 Crystal Drive
Arlington, VA

The fax phone numbers for the organization where this application or proceeding is assigned are:

Official communications:	(703) 746-7239
Non-Official / Draft communications	(703) 746-7240
After Final communications	(703) 746-7238

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist, whose telephone number is: (703) 305-3900.

Ayal I. Sharon

Art Unit 2123

February 11, 2003

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER